

APPENDIX B

COST ESTIMATE BACKUP AND REPORT

NOTE:

Appendix B contains a summary of the Cost Estimate. The complete cost estimate and all the backup data are available under separate cover. The backup data include levee cross-section data in AUTOCAD format. The cross-sections are available on CD. To obtain the complete cost estimate and all the backup data, contact CALFED's Project Manager for the Levee System Integrity Program.



CALFED LEVEE REHABILITATION STUDY

INTRODUCTION

CALFED has chosen the levee standards established for the Delta under Public Law 84-99 (PL-99) as the minimum level of protection for system integrity. This study inventories the levees within the legal Delta not meeting the PL-99 standard and estimates quantities and costs required to rehabilitate these levees.

SCOPE OF STUDY

The study includes three main components: *an inventory of the levees not meeting the PL-99 standard, quantity and cost estimates to meet the standard, and an evaluation and estimated cost for the associated land, easements, rights of way, relocations and disposal (LERRD's) required to perform the levee rehabilitation.*

Generally, the levees not meeting the PL-99 standard consist of the non-project levees in the Delta (Figure 1). Unless there was specific knowledge of site conditions, project levees were assumed to meet the PL-99 standard. The inventory attempts to identify a complete listing of levee districts and associated levee miles not meeting the standard. In addition, the inventory identifies levees which meet the geometric standard but experience significant seepage during high water.

Quantity and cost estimates were based on a comparison of the design levee standard geometry as set forth in PL-99, to the existing levee configuration. Data used for these levee rehabilitation cost estimates included actual levee data from 60% of the existing non-project levee districts, representing 69% of the total mileage of substandard levees. The results of the estimates using actual data were then used to extrapolate the same information for islands where actual data was not available (Figure 2).

Finally, the study evaluated an estimated cost for the LERRD's associated with the levee rehabilitation. Generally, the required levee improvements extend from the levee toe landward into existing private property. In addition, the levee improvements impact existing infrastructure which must be evaluated and costs estimated for work to move or replace the infrastructure. Components of this infrastructure include pumps and siphons, utility lines and

poles, seepage and irrigation ditches and buildings. The LERRD's also include easement acquisition for the additional levee section. The results of this study are summarized on Table 1.

STUDY DETAILS

The study estimates the quantity and cost required to obtain the PL-99 standards for 55 islands or levee districts totaling 521.2 miles of levee. Improvement costs, based on fill and roadway estimates, were used to project other costs associated with levee projects such as engineering, environmental and regulatory. Described below are details regarding the components of the cost estimates.

Fill Quantity Estimates

The basis for establishing fill quantity required to meet the PL-99 standards is establishment of the standard levee section for a particular levee in the Delta. PL-99 simplifies its standard by requiring freeboard of 1.5' above the 100-year flood elevation, a 16' wide crown, a 2 (horizontal)-to-1 (vertical) waterside slope and a variable landside slope based on the levee height and estimated depth of organic material in the foundation. This varying landside slope ranges between 3:1 to 5:1 (Figure 3). Organic material depths were taken from the Department of Water Resources' map entitled, "Organic Isopach Map", October 18, 1976. Flood elevations were from the Corps of Engineers' report entitled, "Sacramento/San Joaquin Delta California Special Study Documentation Report", dated March 1993. Levee heights were computed from actual levee survey data.

Fifty-five of the Delta islands were found to not meet the PL-99 standards. Actual survey data from 32 of these islands was used for the cost estimates. These 32 islands represent 352 miles or 68% of the 521.2 miles of levee providing less than PL-99 level of protection. These survey data were obtained directly from the districts. At a minimum, cross sections were taken at 1,000' intervals. Using this data and superimposing the required PL-99 standard yields the "neat" fill requirements at each section. The average end method was then used to estimate the fill along the levee between each cross section.

The "neat" fill estimates were the basis for the Delta levee rehabilitation. The "neat" fill estimates were increased by 100% to account for losses associated with this type of work. Losses amounting to 150% of the "neat" fill requirement were applied where the levee still

appears to be experiencing significant foundation consolidation. Islands where this is occurring include Sherman, Twitchell, Empire, Bouldin, Tyler and Webb Tract. Much of the loss associated with levee rehabilitation on Delta islands is attributable to consolidation of organic material, consolidation of loosely compacted fill and accuracy of this survey data. Estimated fill based on the above factors is shown on Table 1.

The rehabilitated levee section will require replacement of existing access ramps. These ramps require approximately 1,000 cubic yards (cy) of fill material. Where the number of ramps was known, the corresponding additional fill material was added to the cross-section quantity estimates. Where the number of ramps was not known, an average of three ramps per levee mile was used to estimate the fill requirement needed for replacement of access ramps.

Detailed survey cross-sections were not obtained for 23 levee districts. The fill requirements to meet the PL-99 standard were extrapolated based on values estimated using detailed information. Five categories of fill requirement ranging from 5,000 cy to 100,000 cy per mile were used. Based on knowledge of the 23 districts, each was assigned the category which most nearly represented its need for levee material.

Roadway Quantity Estimates

When raising and widening a levee, the gravel roadway is destroyed. Therefore, quantity estimates were made to replace the roadway under the CALFED system integrity program. Gravel was assumed to be 6-inches by 16-feet for the general levee section. For levees which currently support a county road, the roadway was designed as 6-inches by 24-feet of gravel subgrade covered by a 20 foot wide triple chip seal.

Cost Estimates

Based on fill and roadway quantity estimates, cost estimates were calculated using high and low unit prices from actual Delta levee projects. Delta levee work experiences a great variance in cost due to factors such as proximity to borrow material, accessibility of the project, condition of access roads and workload of local contractors. It is anticipated that a program as extensive as the CALFED will generate new markets which don't currently exist, thus keeping the levee costs to a minimum. For the sake of this study, the improvement costs were left to range between low and high.

Additional Costs

Levee improvement includes an array of costs to account for services required to plan and construct a project. Based as a percentage of the subtotal of the fill and roadway cost estimates, the following costs were included:

- Engineering Planning and Design: \$10,000 + 5% to \$10,000 + 8%
- Geotechnical Analysis: 5% to 8%
- Construction Inspection and Contract Administration: 5% to 8%
- Environmental and Regulatory: 5% to 8%
- CMARP: 1%
- Erosion Protection for Newly Placed Fill: 8%
- Environmental Mitigation: 15%
- Ongoing Repair: 25%
- Overall Contingency to Account for Unforeseen Costs: 20%

Seepage Repair

Although most federally reconstructed project levees in the Delta meet or exceed the PL-99 geometric standard, there are several locations where the sand composition of the levees causes a threat of seepage and piping of material during high water. This seepage could lead to a reduction in the factor of safety, diminishing the level of protection. The bulk of these levees are located along the San Joaquin River Channel upstream of Stockton. Several areas have also been noted along the Sacramento River and Georgian Slough. The total mileage where this type of repair is required was estimated based on accounts during the January 1997 floods. Cost estimates to repair this type of problem were based on costs estimated by the Corps of Engineers to repair levees along the San Joaquin River at Reclamation District No. 17 (Figure 4). It was assumed 33% of a district's levee system, where seepage has been a problem, would have to be repaired. Table 2 summarizes seepage repair estimates.

Lands, Easements, Rights of Way, Relocations and Disposal (LERRD'S)

The third component of the study was to evaluate the cost of LERRD's resulting from the CALFED System Integrity Program. As described above, a rehabilitation as extensive as CALFED's program will impact existing infrastructure. Widening of the levees will encroach

upon existing private property (Figure 5). Therefore, cost estimates were made to acquire easements for the existing land required due to the levee rehabilitation, and to move or replace existing infrastructure. This infrastructure includes irrigation and drainage pipes and pumping plants, power poles, homes and ditches. These estimates were based on recent experience of a similar type project performed on the levees surrounding the Stockton Metropolitan Area (Table 3).

Summary

Based on the above, the total costs of the levee rehabilitation program is estimated to range from \$613 million to \$1.28 billion. The range is based on the uncertainty regarding location and cost of levee fill material. The breakdown for the costs, as shown on Tables 1-3, is as follows:

| | Low | High |
|------------------------|-----------------------|-------------------------|
| PL-99 Improvement Cost | \$ 356,970,324 | \$ 1,023,686,285 |
| Seepage Repair | \$ 164,229,790 | \$ 164,229,790 |
| LEERRD's | \$ 92,028,000 | \$ 92,028,000 |
| | <u>\$ 613,228,114</u> | <u>\$ 1,279,944,075</u> |

These costs include acquisition of easements over 3,419 acres for the PL-99 improvement and 1,209 acres for the seepage repair.

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Sacramento-San Joaquin Delta, California

Levee Rehabilitation Study

| District Number | Reclamation District | Levee Miles | | | Total Fill Volume (yd ³) | Estimated PL-99 Improvement Cost | |
|-----------------|------------------------------|-------------|-------------|-------|--------------------------------------|----------------------------------|---------------|
| | | Project | Non-Project | Total | | Low | High |
| 556 | 1 Andrus Island, Upper | 11.2 | 0.6 | 11.8 | 30,000 | \$517,290 | \$1,408,450 |
| 2126 | 1 Atlas Tract | 0.0 | 1.9 | 1.9 | 57,000 | \$927,394 | \$2,631,111 |
| 2028 | 2 Bacon Island | 0.0 | 14.3 | 14.3 | 1,420,443 | \$20,712,541 | \$60,697,769 |
| | 2 Bear Creek | 46.5 | 0.0 | 46.5 | 0 | \$0 | \$0 |
| | 2 Bethany | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Bethel Island MID | 0.0 | 11.5 | 11.5 | 230,634 | \$4,188,633 | \$11,473,059 |
| 2042 | 2 Bishop Tract | 0.0 | 5.8 | 5.8 | 0 | \$0 | \$0 |
| | 2 Bishop Tract, East | | | 0.0 | 0 | \$0 | \$0 |
| 2121 | 2 Bixler | 0.0 | 2.3 | 2.3 | 0 | \$0 | \$0 |
| 404 | 2 Boggs (Moss) Tract | 4.0 | 1.2 | 5.2 | 0 | \$0 | \$0 |
| | 2 Borrow Pond Area | | | 0.0 | 0 | \$0 | \$0 |
| 756 | 2 Bouldin Island | 0.0 | 18.0 | 18.0 | 2,454,122 | \$33,917,002 | \$101,465,550 |
| 2033 | 2 Brack Tract | 0.0 | 10.8 | 10.8 | 246,291 | \$4,162,288 | \$11,645,933 |
| 2059 | 2 Bradford Island | 0.0 | 7.4 | 7.4 | 797,028 | \$11,222,624 | \$33,430,037 |
| 317, 407 & 2067 | 2 Brannan-Andrus LMD | 19.3 | 10.1 | 29.4 | 1,260,711 | \$19,147,841 | \$54,942,188 |
| | 2 Browns Island | | | 0.0 | 0 | \$0 | \$0 |
| 800 | 2 Byron Tract | 0.0 | 9.7 | 9.7 | 0 | \$0 | \$0 |
| 2098 | 2 Cache Haas | 12.1 | 0.0 | 12.1 | 0 | \$0 | \$0 |
| 2086 | 2 Canal Ranch | 0.0 | 7.5 | 7.5 | 511,350 | \$7,374,253 | \$21,731,317 |
| | 2 Chipps Island | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Clifton Court | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Collinsville | | | 0.0 | 0 | \$0 | \$0 |
| 2117 | 2 Coney Island | 0.0 | 5.4 | 5.4 | 37,477 | \$1,004,522 | \$2,428,368 |
| 2111 | 1 Dead Horse Island | 0.0 | 2.6 | 2.6 | 13,258 | \$384,338 | \$915,177 |
| | 2 Decker | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Delta-Mendota | | | 0.0 | 0 | \$0 | \$0 |
| | 1 Drexler Island | 0.0 | 4.0 | 4.0 | 20,000 | \$614,178 | \$1,495,435 |
| 536 | 2 Egbert Tract | 14.0 | 0.0 | 14.0 | 0 | \$0 | \$0 |
| 813 | 2 Ehrheart | 2.0 | 6.0 | 8.0 | 0 | \$0 | \$0 |
| 2029 | 2 Empire Tract | 0.0 | 10.5 | 10.5 | 1,093,053 | \$15,737,352 | \$46,227,173 |
| 773 | 1 Fabian Tract | 0.0 | 18.8 | 18.8 | 188,000 | \$4,541,103 | \$11,439,905 |
| 2113 | 1 Fay Island | 0.0 | 1.6 | 1.6 | 8,026 | \$240,435 | \$569,585 |
| 1002 | 1 Glanville Tract | 0.0 | 13.0 | 13.0 | 65,099 | \$2,335,317 | \$5,292,676 |
| 765 | 2 Glide | 1.7 | 4.0 | 5.7 | 0 | \$0 | \$0 |
| 3 | 2 Grand Island | 29.0 | 0.0 | 29.0 | 0 | \$0 | \$0 |
| 1609 | 2 Harveys | | | 0.0 | 0 | \$0 | \$0 |
| 2060 | 2 Hastings Tract | 16.0 | 0.0 | 16.0 | 0 | \$0 | \$0 |
| 999 | 2 Holland Land | 27.0 | 5.8 | 32.8 | 0 | \$0 | \$0 |
| 2025 | 2 Holland Tract | 0.0 | 10.9 | 10.9 | 182,612 | \$3,816,975 | \$9,912,258 |
| 2116 | 2 Holt Station | 0.0 | 0.4 | 0.4 | 0 | \$0 | \$0 |
| 799 | 1 Hotchkiss Tract | 0.0 | 6.3 | 6.3 | 121,248 | \$2,371,992 | \$6,406,959 |
| 830 | 1 Jersey Island | 0.0 | 15.6 | 15.6 | 468,000 | \$7,527,319 | \$21,485,215 |
| 2038 | 2 Jones Tract, Lower | 0.0 | 8.8 | 8.8 | 173,847 | \$3,283,897 | \$8,908,588 |
| 2039 | 2 Jones Tract, Upper | 0.0 | 9.3 | 9.3 | 32,586 | \$866,491 | \$2,142,417 |
| 2085 | 2 Kasson | 6.2 | | 6.2 | 0 | \$0 | \$0 |
| | 2 Kimball Island | | | 0.0 | 0 | \$0 | \$0 |
| 2044 | 2 King Island | 0.0 | 9.0 | 9.0 | 276,103 | \$4,483,102 | \$12,688,246 |
| 369 | 1 Libby McNeil | 1.0 | 0.7 | 1.7 | 66,000 | \$981,195 | \$2,864,665 |
| 2093 | 2 Liberty Island | 0.0 | 20.5 | 20.5 | 0 | \$0 | \$0 |
| 1608 | 2 Lincoln Village West | 0.0 | 4.0 | 4.0 | 0 | \$0 | \$0 |
| 307 | 2 Lisbon | 7.8 | 5.2 | 13.0 | 0 | \$0 | \$0 |
| 2084 | 2 Little Egbert Tract | 0.0 | 7.0 | 7.0 | 0 | \$0 | \$0 |
| | 2 Little Franks Tract | | | 0.0 | 0 | \$0 | \$0 |
| 2118 | 1 Little Mandeville | 0.0 | 4.5 | 4.5 | 450,000 | \$6,348,833 | \$18,876,664 |
| | 2 Los Medanos | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Maintenance Area 9 | 19.6 | 0.0 | 19.6 | 0 | \$0 | \$0 |
| 2027 | 2 Mandeville Island | 0.0 | 14.3 | 14.3 | 502,358 | \$7,789,541 | \$22,407,366 |
| 2110 | 1 McCormack-Williamson Tract | 0.0 | 8.8 | 8.8 | 525,000 | \$7,696,924 | \$22,600,613 |
| 2030 | 2 McDonald Island | 0.0 | 13.7 | 13.7 | 98,170 | \$2,482,325 | \$6,316,103 |
| 2075 | 2 McMullin | 7.4 | 0.0 | 7.4 | 0 | \$0 | \$0 |
| 2041 | 2 Medford Island | 0.0 | 5.9 | 5.9 | 453,667 | \$6,494,287 | \$19,197,006 |
| 150 | 2 Merritt Island | 18.1 | 0.0 | 18.1 | 0 | \$0 | \$0 |
| 2021 | 2 Mildred Island | 0.0 | 7.3 | 7.3 | 0 | \$0 | \$0 |
| | 2 Montezuma Flats | | | 0.0 | 0 | \$0 | \$0 |
| | 2 Montezuma Island | | | 0.0 | 0 | \$0 | \$0 |
| 2107 | 2 Mossdale 2 | 4.2 | 0.0 | 4.2 | 0 | \$0 | \$0 |
| 17 | 2 Mossdale Tract | 14.0 | 0.0 | 14.0 | 0 | \$0 | \$0 |
| 1007 | 1 Naglee Burke Tract | 0.0 | 8.3 | 8.3 | 83,000 | \$1,813,377 | \$4,762,587 |
| 348 | 2 New Hope Tract | 0.0 | 18.6 | 18.6 | 291,322 | \$4,928,678 | \$13,860,672 |

Sacramento-San Joaquin Delta, California

Levee Rehabilitation Study

| District Number | Reclamation District | Levee Miles | | | Total Fill Volume (yd³) | Estimated PL-99 Improvement Cost | |
|-----------------|-------------------------------|-------------|-------------|--------|-------------------------|----------------------------------|-----------------|
| | | Project | Non-Project | Total | | Low | High |
| 2 | Oakley | | | 0.0 | 0 | \$0 | \$0 |
| 2024 | Orwood Tract | 0.0 | 10.9 | 10.9 | 12,633 | \$729,834 | \$1,640,042 |
| 2036 | Palm Tract | 0.0 | 7.5 | 7.5 | 199,301 | \$3,298,313 | \$9,338,080 |
| 2095 | 2 Paradise | 4.0 | 0.0 | 4.0 | 0 | \$0 | \$0 |
| 2058 | 1 Pescadero Tract | 6.7 | 2.2 | 8.9 | 43,340 | \$1,325,842 | \$3,248,954 |
| 2104 | 2 Peters | 7.4 | 0.0 | 7.4 | 0 | \$0 | \$0 |
| 551 | 2 Pierson District | 8.4 | 7.0 | 15.4 | 0 | \$0 | \$0 |
| 1667 | 2 Prospect Island | 2.9 | 7.1 | 10.0 | 0 | \$0 | \$0 |
| 2090 | Quimby Island | 0.0 | 7.0 | 7.0 | 426,462 | \$6,244,751 | \$18,343,567 |
| 755 | 2 Randall | 1.9 | 0.0 | 1.9 | 0 | \$0 | \$0 |
| 2037 | Rindge Tract | 0.0 | 15.7 | 15.7 | 520,276 | \$8,310,102 | \$23,847,863 |
| 2114 | 2 Rio Blanco Tract | 0.0 | 4.0 | 4.0 | 0 | \$0 | \$0 |
| 2064 | 2 River Junction | 11.6 | 0.0 | 11.6 | 0 | \$0 | \$0 |
| 524 | 1 Robert Island, Middle | 6.1 | 3.7 | 9.8 | 63,447 | \$1,932,828 | \$4,741,046 |
| 684 | Roberts Island, Lower | 0.0 | 16.0 | 16.0 | 43,689 | \$1,824,462 | \$4,259,136 |
| 544 | 1 Roberts Island, Upper | 10.6 | 4.4 | 15.0 | 88,068 | \$2,678,112 | \$6,574,274 |
| | 2 Rough and Ready Island | 0.0 | 6.7 | 6.7 | 0 | \$0 | \$0 |
| 501 | 2 Ryer Island | 20.6 | 0.0 | 20.6 | 0 | \$0 | \$0 |
| | 2 Sacramento Deepwater | | | 0.0 | 0 | \$0 | \$0 |
| 2074 | 2 Sargent Barnhart Tract | 1.5 | 2.8 | 4.3 | 0 | \$0 | \$0 |
| 341 | Sherman Island | 9.7 | 9.8 | 19.5 | 321,559 | \$5,778,494 | \$15,639,373 |
| | 2 Sherman Island, West | | | 0.0 | 0 | \$0 | \$0 |
| 2115 | Shima Tract | 0.0 | 6.6 | 6.6 | 41,563 | \$1,142,313 | \$2,853,331 |
| | 1 Shin Kee Tract | 0.0 | 3.9 | 3.9 | 360,000 | \$5,079,744 | \$15,099,311 |
| | 2 SJCFCD Five Mile Slough | | | 0.0 | 0 | \$0 | \$0 |
| | 2 SJCFCD Fourteen Mile Slough | | | 0.0 | 0 | \$0 | \$0 |
| | 2 SJCFCD Mosher Slough | | | 0.0 | 0 | \$0 | \$0 |
| 1614 | 2 Smith Tract | 6.0 | 2.8 | 8.8 | 0 | \$0 | \$0 |
| | 2 Spinner Island | | | 0.0 | 0 | \$0 | \$0 |
| 2089 | 2 Stark | 2.9 | 0.7 | 3.6 | 0 | \$0 | \$0 |
| 38 | Staten Island | 0.0 | 25.4 | 25.4 | 921,949 | \$14,349,298 | \$41,373,293 |
| 2062 | 2 Stewart Tract | 12.3 | 0.0 | 12.3 | 0 | \$0 | \$0 |
| 349 | 2 Sutter Island | 12.5 | 0.0 | 12.5 | 0 | \$0 | \$0 |
| 548 | 1 Terminus Tract | 0.0 | 16.1 | 16.1 | 1,262,330 | \$18,495,932 | \$54,337,453 |
| 2108 | 2 Tinsley | | | 0.0 | 0 | \$0 | \$0 |
| 1601 | Twitshell Island | 2.5 | 9.3 | 11.8 | 1,291,084 | \$18,588,176 | \$54,670,526 |
| 563 | Tyler Island | 12.2 | 10.7 | 22.9 | 2,863,563 | \$41,800,546 | \$121,994,769 |
| 1 | Union Island, East | 1.0 | 13.0 | 14.0 | 0 | \$0 | \$0 |
| 2 | 1 Union Island, West | 0.0 | 16.2 | 16.2 | 80,492 | \$2,611,017 | \$6,240,156 |
| 1607 | 1 Van Sickle Island | 0.0 | 3.8 | 3.8 | 380,000 | \$5,357,353 | \$15,925,323 |
| 2065 | Veale Tract | 0.0 | 5.7 | 5.7 | 21,243 | \$718,854 | \$1,721,402 |
| 2023 | 1 Venice Island | 0.0 | 12.3 | 12.3 | 123,977 | \$2,668,367 | \$7,001,564 |
| 2040 | 1 Victoria Island | 0.0 | 15.1 | 15.1 | 150,775 | \$3,316,281 | \$8,735,545 |
| 554 | 2 Walnut Grove | 1.0 | 1.2 | 2.2 | 0 | \$0 | \$0 |
| 2094 | 2 Walthall | 3.3 | 0.0 | 3.3 | 0 | \$0 | \$0 |
| 2026 | Webb Tract | 0.0 | 12.8 | 12.8 | 606,166 | \$9,042,328 | \$26,322,968 |
| 828 | 2 Weber | 0.0 | 1.2 | 1.2 | 0 | \$0 | \$0 |
| | 2 West Island | | | 0.0 | 0 | \$0 | \$0 |
| 900 | 2 West Sacramento | 12.0 | 1.3 | 13.3 | 0 | \$0 | \$0 |
| 2096 | 2 Wetherbee | 0.2 | 0.0 | 0.2 | 0 | \$0 | \$0 |
| 2122 | 1 Winter Island | 0.0 | 4.8 | 4.8 | 480,000 | \$6,765,248 | \$20,115,682 |
| 2072 | Woodward Island | 0.0 | 8.8 | 8.8 | 323,327 | \$5,042,183 | \$14,524,929 |
| 2119 | Wright-Elmwood Tract | 0.0 | 6.8 | 6.8 | 82,516 | \$1,957,902 | \$4,914,584 |
| 2068 | 2 Yolano | 8.7 | 0.0 | 8.7 | 0 | \$0 | \$0 |
| | 2 Yolo Bypass Unit 4 | 3.6 | 0.0 | 3.6 | 0 | \$0 | \$0 |
| | | 430.6 | 635.2 | 1065.8 | 22,864,165 | \$356,970,324 | \$1,023,686,285 |

1 Extrapolated Values

2 Project Levee, Meets or Exceeds PL84-99 or Non-Levee

| | Districts | Levee Miles | |
|------------------------------------------------------|-----------|-------------|-------------|
| | | Project | Non-Project |
| Detailed Quantity Estimates | 32 | 44.7 | 352.0 |
| Extrapolated Values | 23 | 35.6 | 169.2 |
| Project Levee, Meets or Exceeds PL84-99 or Non-Levee | 69 | 350.3 | 114.0 |
| | 124 | 430.6 | 635.2 |

Sacramento - San Joaquin Delta, California
Levee Rehabilitation Study
Seepage Control

| Reclamation District No. | Name of Island/Tract | Mobilization/Demo (cost est.) | Berm Drain Rock (cost est.) | Berm Material (cost est.) | Geotextile (cost est.) | Total (cost est.) |
|-------------------------------------|-------------------------|----------------------------------|--------------------------------|------------------------------|---------------------------|----------------------|
| 317, 407 & 2067 | Brannan-Andrus Island | \$150,000 | \$21,318,528 | \$2,173,248 | \$3,622,080 | \$27,263,856 |
| 3 | Grand Island | \$150,000 | \$21,028,480 | \$2,143,680 | \$3,572,800 | \$26,894,960 |
| 2025 | Holland Tract | \$150,000 | \$7,903,808 | \$805,728 | \$1,342,880 | \$10,202,416 |
| 2075 | McMullin Ranch | \$150,000 | \$5,365,888 | \$547,008 | \$911,680 | \$6,974,576 |
| 2107 | Mossdale 2 | \$150,000 | \$3,045,504 | \$310,464 | \$517,440 | \$4,023,408 |
| 17 | Mossdale Tract | \$150,000 | \$10,151,680 | \$1,034,880 | \$1,724,800 | \$13,061,360 |
| 2095 | Paradise | \$150,000 | \$2,900,480 | \$295,680 | \$492,800 | \$3,838,960 |
| 2058 | Pescadero Tract | \$150,000 | \$6,453,568 | \$657,888 | \$1,096,480 | \$8,357,936 |
| 2064 | River Junction | \$150,000 | \$8,411,392 | \$857,472 | \$1,429,120 | \$10,847,984 |
| 684 | Roberts Island, Lower | \$150,000 | \$11,601,920 | \$1,182,720 | \$1,971,200 | \$14,905,840 |
| 524 | Roberts Island, Middle | \$150,000 | \$7,106,176 | \$724,416 | \$1,207,360 | \$9,187,952 |
| 544 | Roberts Island, Upper | \$150,000 | \$10,876,800 | \$1,108,800 | \$1,848,000 | \$13,983,600 |
| 2062 | Stewart Tract | \$150,000 | \$8,918,976 | \$909,216 | \$1,515,360 | \$11,493,552 |
| 2094 | Walthall | \$150,000 | \$2,392,896 | \$243,936 | \$406,560 | \$3,193,392 |
| SEEPAGE CONTROL GRAND TOTAL: | | | | | | \$164,229,790 |

Sacramento - San Joaquin Delta, California
Lands, Easements, Right of Ways, Relocations & Disposals
(LERRDS)

| Reclamation District No. | Name of Island/Tract | Negotiation (cost est.) | Land (cost est.) | Toe Drain (cost est.) | Siphons (cost est.) | Power Poles (cost est.) | Land (seepage) (cost est.) | Total LERRDS (cost est.) |
|--------------------------|-----------------------------------------|-------------------------|------------------|-----------------------|---------------------|-------------------------|----------------------------|--------------------------|
| 556 | ¹ Andrus Island, Upper | \$15,000 | \$8,000 | \$5,000 | \$15,000 | \$100,000 | \$0 | \$143,000 |
| 2126 | ¹ Atlas Tract | \$90,000 | \$32,000 | \$20,000 | \$60,000 | \$100,000 | \$0 | \$302,000 |
| 2028 | Bacon Island | \$405,000 | \$396,000 | \$151,000 | \$975,000 | \$100,000 | \$0 | \$2,027,000 |
| | Bethel Island MID | \$10,230,000 | \$10,259,000 | \$122,000 | \$345,000 | \$100,000 | \$0 | \$21,056,000 |
| 756 | Bouldin Island | \$105,000 | \$435,000 | \$190,000 | \$795,000 | \$125,000 | \$0 | \$1,650,000 |
| 2033 | Brack Tract | \$225,000 | \$224,000 | \$122,000 | \$300,000 | \$100,000 | \$0 | \$971,000 |
| 2059 | Bradford Island | \$915,000 | \$212,000 | \$78,000 | \$120,000 | \$100,000 | \$0 | \$1,425,000 |
| 317, 407 & 2067 | Brannan-Andrus LMD | \$3,330,000 | \$219,000 | \$136,000 | \$390,000 | \$100,000 | \$136,000 | \$4,175,000 |
| 2086 | Canal Ranch | \$105,000 | \$257,000 | \$102,000 | \$315,000 | \$100,000 | \$0 | \$879,000 |
| 2117 | Coney Island | \$30,000 | \$92,000 | \$57,000 | \$75,000 | \$100,000 | \$0 | \$354,000 |
| 2111 | ¹ Dead Horse Island | \$60,000 | \$51,000 | \$28,000 | \$105,000 | \$100,000 | \$0 | \$344,000 |
| | Drexler Island | \$90,000 | \$68,000 | \$42,000 | \$120,000 | \$100,000 | \$0 | \$420,000 |
| 2029 | Empire Tract | \$255,000 | \$275,000 | \$111,000 | \$705,000 | \$100,000 | \$0 | \$1,446,000 |
| 773 | ¹ Fabian Tract | \$435,000 | \$319,000 | \$199,000 | \$570,000 | \$130,000 | \$0 | \$1,653,000 |
| 2113 | ¹ Fay Island | \$45,000 | \$31,000 | \$17,000 | \$45,000 | \$100,000 | \$0 | \$238,000 |
| 1002 | ¹ Glanville Tract | \$255,000 | \$253,000 | \$137,000 | \$30,000 | \$100,000 | \$0 | \$775,000 |
| 3 | ¹ Grand Island | \$2,175,000 | \$0 | \$0 | \$870,000 | \$100,000 | \$1,406,000 | \$3,145,000 |
| 2025 | Holland Tract | \$435,000 | \$223,000 | \$116,000 | \$360,000 | \$100,000 | \$103,000 | \$1,234,000 |
| 799 | ¹ Hotchkiss Tract | \$375,000 | \$2,310,000 | \$94,000 | \$570,000 | \$100,000 | \$0 | \$3,449,000 |
| 830 | ¹ Jersey Island | \$315,000 | \$265,000 | \$165,000 | \$465,000 | \$105,000 | \$0 | \$1,315,000 |
| 2038 | Jones Tract, Lower | \$180,000 | \$162,000 | \$95,000 | \$330,000 | \$100,000 | \$0 | \$867,000 |
| 2039 | Jones Tract, Upper | \$120,000 | \$85,000 | \$53,000 | \$255,000 | \$100,000 | \$0 | \$613,000 |
| 2044 | King Island | \$180,000 | \$207,000 | \$96,000 | \$615,000 | \$100,000 | \$0 | \$1,198,000 |
| 369 | ¹ Libby McNeil | \$15,000 | \$19,000 | \$12,000 | \$30,000 | \$100,000 | \$0 | \$176,000 |
| 2118 | ¹ Little Mandeville | \$15,000 | \$76,000 | \$48,000 | \$90,000 | \$100,000 | \$0 | \$329,000 |
| 2027 | Mandeville Island | \$105,000 | \$275,000 | \$150,000 | \$300,000 | \$100,000 | \$0 | \$930,000 |
| 2110 | ¹ McCormack-Williamson Tract | \$660,000 | \$427,000 | \$93,000 | \$264,000 | \$100,000 | \$0 | \$1,544,000 |
| 2030 | McDonald Island | \$150,000 | \$247,000 | \$145,000 | \$450,000 | \$100,000 | \$0 | \$1,092,000 |
| 2075 | ¹ McMullin Ranch | \$555,000 | \$0 | \$0 | \$222,000 | \$100,000 | \$359,000 | \$877,000 |
| 2041 | Medford Island | \$60,000 | \$120,000 | \$62,000 | \$150,000 | \$100,000 | \$0 | \$492,000 |
| 2107 | ¹ Mossdale 2 | \$315,000 | \$0 | \$0 | \$126,000 | \$100,000 | \$204,000 | \$541,000 |
| 17 | ¹ Mossdale Tract | \$1,050,000 | \$0 | \$0 | \$420,000 | \$100,000 | \$679,000 | \$1,570,000 |
| 1007 | ¹ Naglee Burke | \$180,000 | \$141,000 | \$88,000 | \$255,000 | \$100,000 | \$0 | \$764,000 |
| 348 | New Hope Tract | \$645,000 | \$316,000 | \$197,000 | \$555,000 | \$130,000 | \$0 | \$1,843,000 |
| 2024 | Orwood Tract | \$225,000 | \$108,000 | \$67,000 | \$195,000 | \$100,000 | \$0 | \$695,000 |
| 2036 | Palm Tract | \$30,000 | \$134,000 | \$83,000 | \$240,000 | \$100,000 | \$0 | \$587,000 |
| 2095 | ¹ Paradise | \$300,000 | \$0 | \$0 | \$120,000 | \$100,000 | \$194,000 | \$520,000 |
| 2058 | ¹ Pescadero Tract | \$180,000 | \$147,000 | \$92,000 | \$150,000 | \$100,000 | \$91,000 | \$669,000 |
| 2090 | Quimby Island | \$30,000 | \$135,000 | \$74,000 | \$90,000 | \$100,000 | \$0 | \$429,000 |
| 2037 | Rindge Tract | \$240,000 | \$329,000 | \$167,000 | \$1,005,000 | \$110,000 | \$0 | \$1,851,000 |
| 2064 | ¹ River Junction | \$870,000 | \$0 | \$0 | \$348,000 | \$100,000 | \$562,000 | \$1,318,000 |
| 684 | Roberts Island, Lower | \$780,000 | \$251,000 | \$156,000 | \$795,000 | \$100,000 | \$155,000 | \$2,082,000 |
| 524 | ¹ Roberts Island, Middle | \$255,000 | \$215,000 | \$134,000 | \$255,000 | \$100,000 | \$133,000 | \$959,000 |
| 544 | ¹ Roberts Island, Upper | \$360,000 | \$299,000 | \$186,000 | \$360,000 | \$120,000 | \$185,000 | \$1,325,000 |
| 341 | Sherman Island | \$1,440,000 | \$329,000 | \$205,000 | \$585,000 | \$135,000 | \$0 | \$2,694,000 |
| 2115 | Shima Tract | \$60,000 | \$111,000 | \$69,000 | \$120,000 | \$100,000 | \$0 | \$460,000 |
| | ¹ Shin Kee Tract | \$15,000 | \$61,000 | \$38,000 | \$105,000 | \$100,000 | \$0 | \$319,000 |
| 38 | Staten Island | \$15,000 | \$554,000 | \$268,000 | \$765,000 | \$180,000 | \$0 | \$1,782,000 |
| 2062 | ¹ Stewart Tract | \$930,000 | \$0 | \$0 | \$369,000 | \$100,000 | \$596,000 | \$1,399,000 |
| 548 | ¹ Terminous Tract | \$630,000 | \$343,000 | \$170,000 | \$615,000 | \$110,000 | \$0 | \$1,868,000 |
| 1601 | Twitchell Island | \$345,000 | \$254,000 | \$126,000 | \$345,000 | \$100,000 | \$0 | \$1,170,000 |
| 563 | Tyler Island | \$705,000 | \$542,000 | \$246,000 | \$915,000 | \$165,000 | \$0 | \$2,573,000 |
| 1 | Union Island, East | \$300,000 | \$255,000 | \$159,000 | \$300,000 | \$100,000 | \$0 | \$1,114,000 |

Sacramento - San Joaquin Delta, California
Lands, Easements, Right of Ways, Relocations & Disposals
(LERRDS)

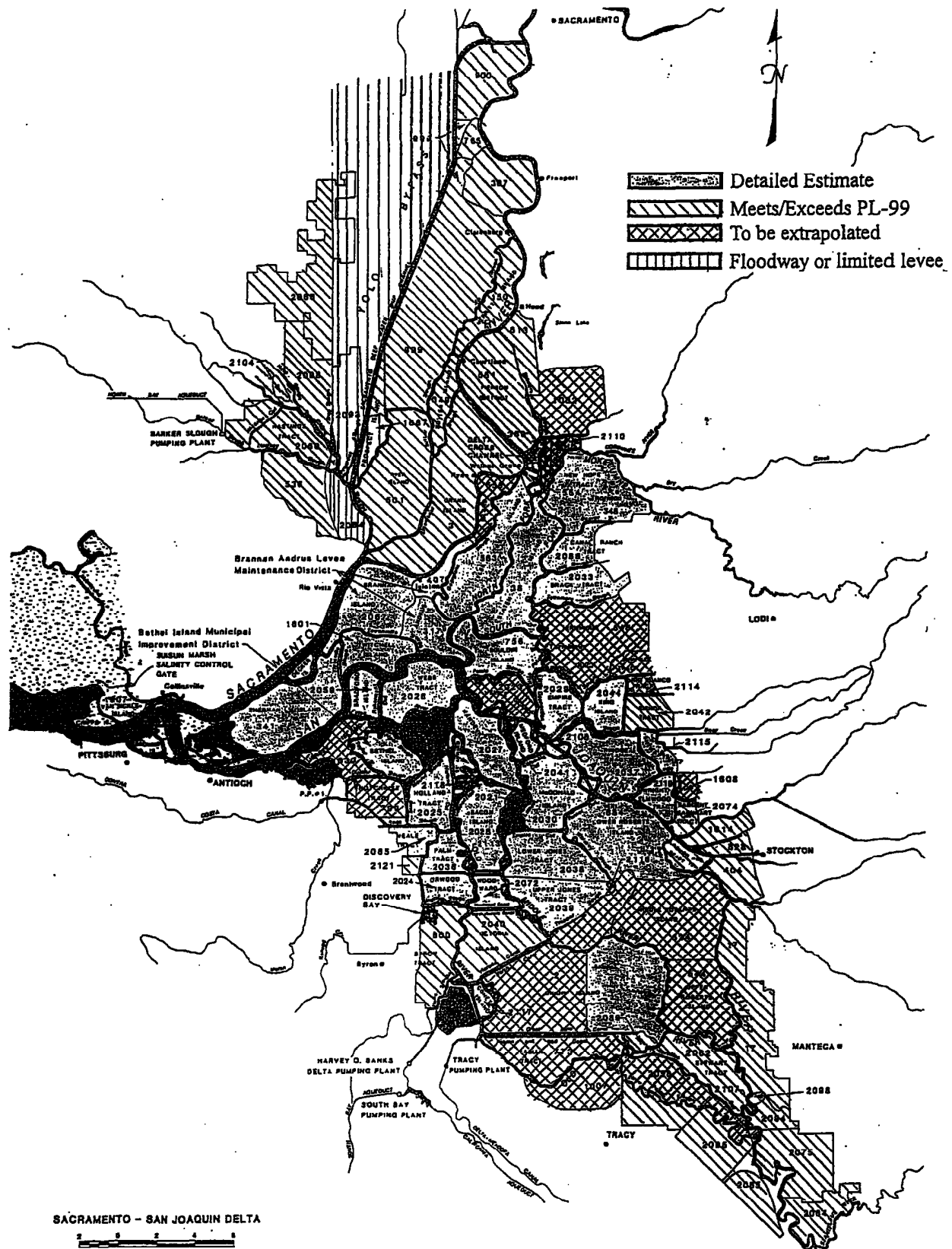
| Reclamation District No. | Name of Island/Tract | Negotiation (cost est.) | Land (cost est.) | Toe Drain (cost est.) | Siphons (cost est.) | Power Poles (cost est.) | Land (seepage) (cost est.) | Total LERRDS (cost est.) |
|-----------------------------|---------------------------------|----------------------------|---------------------|--------------------------|------------------------|----------------------------|-------------------------------|-----------------------------|
| 2 | ¹ Union Island, West | \$375,000 | \$273,000 | \$170,000 | \$885,000 | \$110,000 | \$0 | \$1,813,000 |
| 1607 | Van Sickle Island | \$90,000 | \$64,000 | \$40,000 | \$120,000 | \$100,000 | \$0 | \$414,000 |
| 2065 | Veale Tract | \$45,000 | \$86,000 | \$53,000 | \$150,000 | \$100,000 | \$0 | \$434,000 |
| 2023 | ¹ Venice Island | \$90,000 | \$240,000 | \$131,000 | \$375,000 | \$100,000 | \$0 | \$936,000 |
| 2040 | ¹ Victoria Island | \$120,000 | \$292,000 | \$159,000 | \$495,000 | \$100,000 | \$0 | \$1,166,000 |
| 2094 | ¹ Walthall | \$255,000 | \$56,000 | \$35,000 | \$99,000 | \$100,000 | \$35,000 | \$545,000 |
| 2026 | Webb Tract | \$270,000 | \$269,000 | \$136,000 | \$330,000 | \$100,000 | \$0 | \$1,105,000 |
| 2122 | ¹ Winter Island | \$15,000 | \$81,000 | \$51,000 | \$150,000 | \$100,000 | \$0 | \$397,000 |
| 2072 | Woodward Island | \$90,000 | \$163,000 | \$94,000 | \$330,000 | \$100,000 | \$0 | \$777,000 |
| 2119 | Wright-Elmwood Tract | \$165,000 | \$120,000 | \$75,000 | \$330,000 | \$100,000 | \$0 | \$790,000 |
| LERRDS GRAND TOTAL: | | | | | | | | \$92,028,000 |

¹ Extrapolated: When no specific data was available, the data was derived from adjoining islands/tracts with similar conditions.

This map illustrates the Sacramento-San Joaquin Delta, a complex network of waterways and islands. The Sacramento River flows from the north, while the San Joaquin River flows from the south. The Yolo Bypass is a significant feature on the western side. The map is divided into numerous tracts and islands, each labeled with its name. Key locations include Sacramento, Yuba City, and Tracy. The map also shows the location of the Harvey O. Banks Delta Pumping Plant and the South Bay Pumping Plant. A scale bar at the bottom indicates distances in miles, and a north arrow is present in the upper right corner.

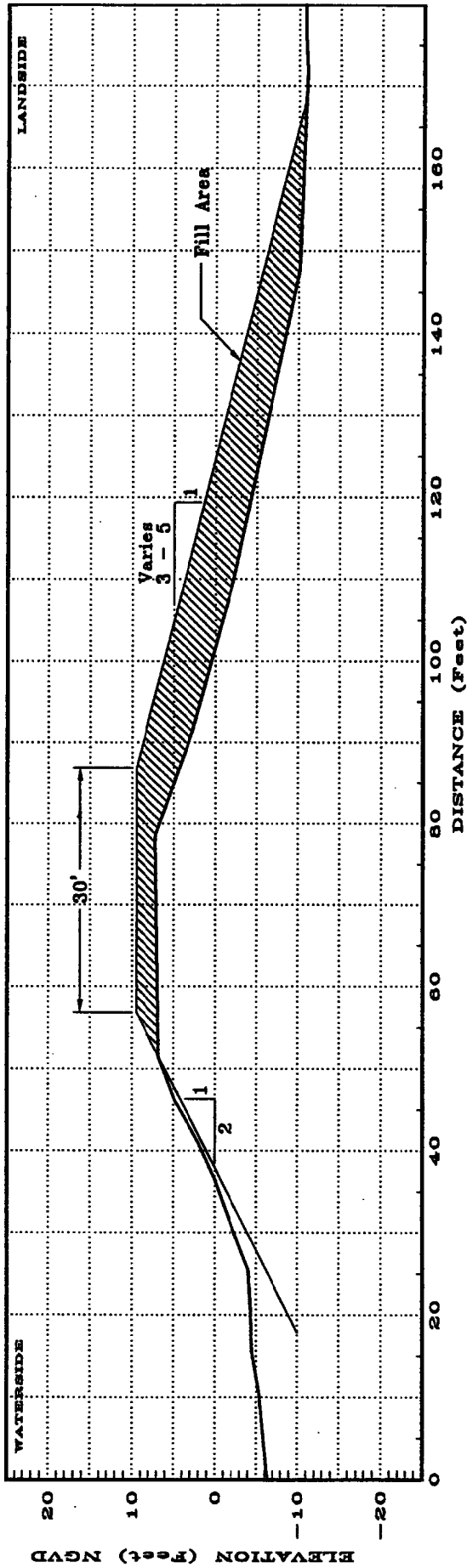
Figure 1

CALFED Levee Rehabilitation Study



TYPICAL LEVEE CROSS SECTION

Stations supporting a County Road



Stations not supporting a County Road

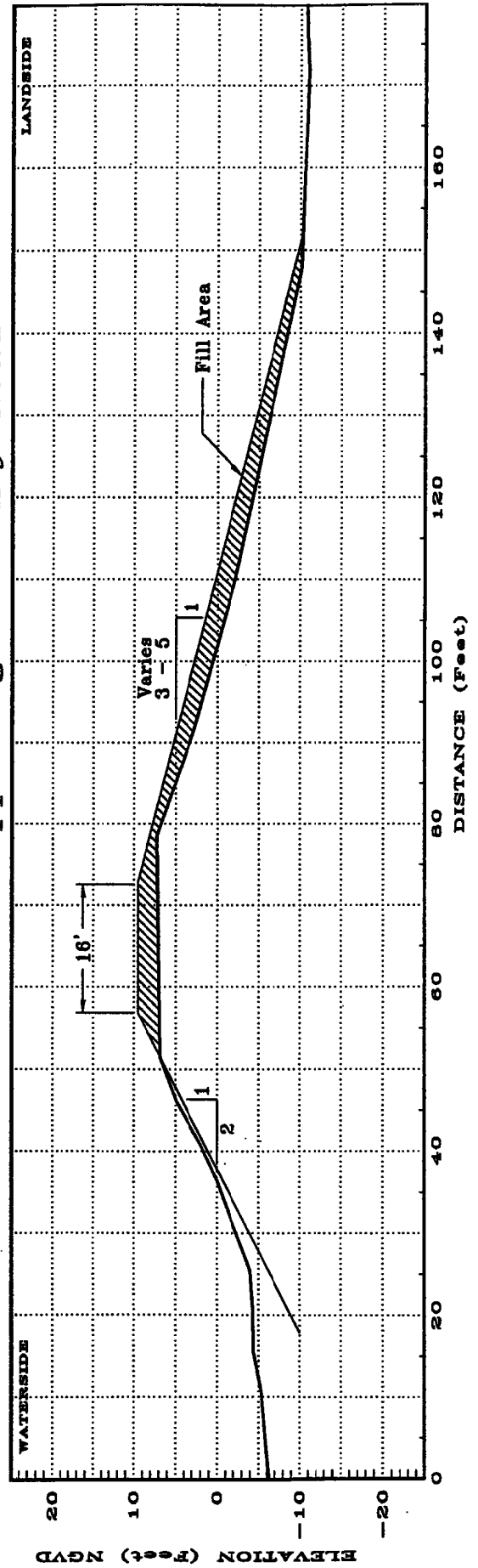


Figure 3

Typical Seepage Gravel Berm Cross Section

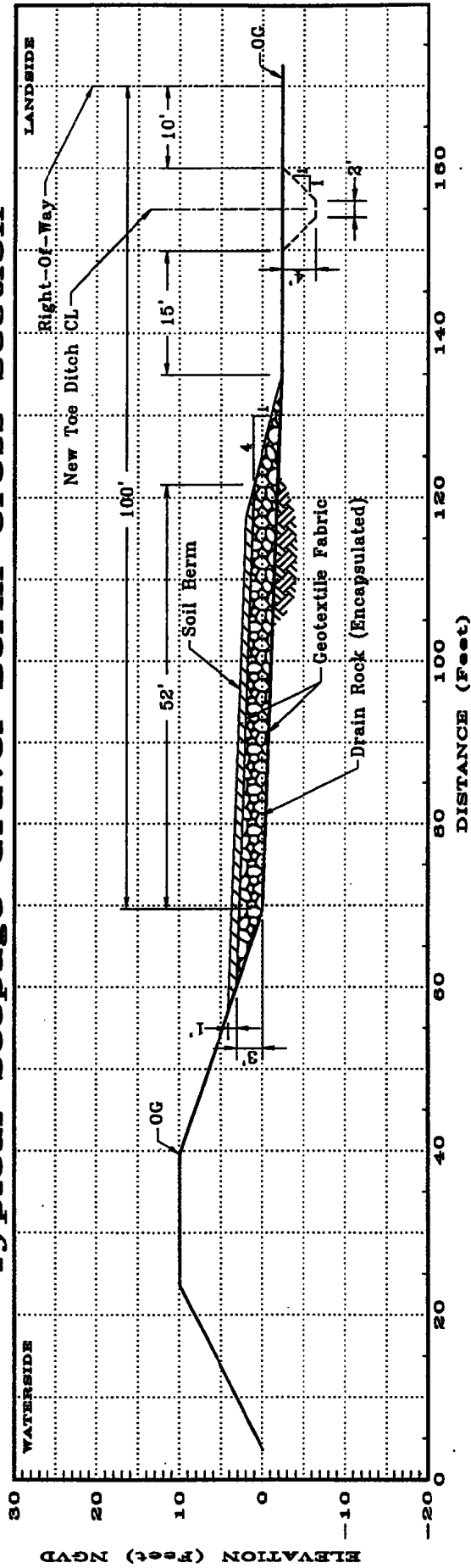


Figure 4

Typical Right-Of-Way Cross Section

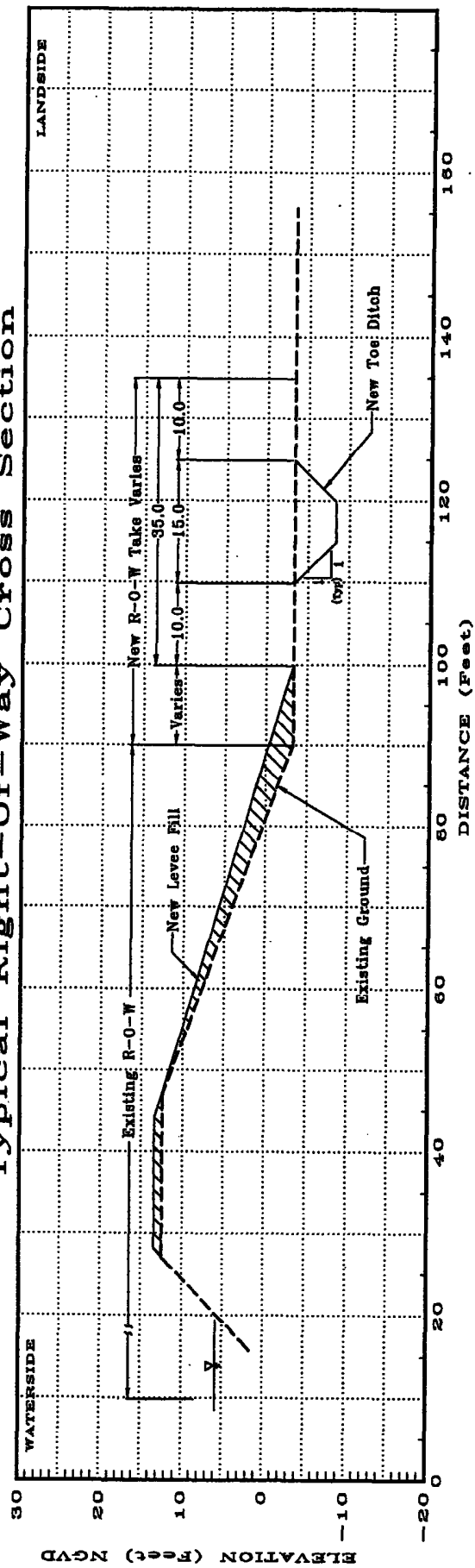


Figure 5